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VERIFICATION OF A TRANSLATION

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My name and post office address are as stated below;

That I am knowledgeable in the German language in which the below identified international application was filed, and that, to the best of my knowledge and belief, the English translation of the amended sheets of the international application No. PCT/DE02/00904 is a true and complete translation of the amended sheets of the above identified international application as filed.

I hereby declare that all the statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the patent application issued thereon.

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Full name of the translator : John Barton COATES

For and on behalf of RWS Group Ltd

Post Office Address : Europa House, Marsham Way,

Gerrards Cross, Buckinghamshire,

England.

impossible to implement appropriate circuitry measures. Firstly, it is difficult to additionally accommodate the external circuitry in the encapsulation body and to carry out the wiring. Secondly, a large amount of heat is developed, because the driver stage and the optical transmission source draw more current at high data rates, and because of the additional external circuitry. This heating can lead to clouding or blackening of the encapsulation body, and to destruction of the transducer module.

The only known way until now to reduce undesirable heating has been to restrict the temperature range to 0°C to about 60°C. External circuitry which reduces the reductions in the power of the transducer module are also dispensed with in the case of transducer modules which are encapsulated in an encapsulation body. Obviously, this is not satisfactory.

The present invention is based on the object of providing an optoelectronic module which allows the use of additional electrical circuits in a transducer module which is encapsulated in an encapsulation body, and which at the same time avoids undesirable heating of the encapsulation body. A further aim is to provide a plug arrangement for POF transmission systems, which allows optical fibers to be connected to an optoelectronic module.

According to the invention, this object is achieved by an optoelectronic module having the features of claim 1, and by a plug arrangement having the features of claim 19. Preferred and advantageous refinements of the invention are specified in the further claims.

The invention accordingly provides that, in the case of an optoelectronic module, the electrical drive and/or

receiving circuit is arranged outside the holding and/or coupling part for the transmitting and/or receiving element, to be precise on a submount, which lies on a plane which runs parallel to the longitudinal axis of the coupling area. The separation of the optical transducer (transmitting and/or receiving element) from the electrical circuitry allows each of these components to be optimized individually. In this case, only the transmitting and/or receiving element and, possibly additionally a monitor diode are/is accommodated in the holding and coupling part.

This results in a small, transparent encapsulation body, which has a largely homogeneous expansion behavior. Only minor stresses occur in the encapsulation body over the maximum temperature range from -40°C to +85°C, as is required in automotive applications, thus considerably improving the fatigue life.

The arrangement of the submount parallel to the longitudinal axis or optical axis of the coupling area allows the submount to be arranged directly on a main circuit board. The submount together with the electrical drive and/or receiving circuit in this case represents a unit which can be tested in advance. It should be mentioned that the electrical drive and/or receiving circuit may also have the additional electrical circuitry mentioned initially, in addition to the actual transducer module or receiving module, thus making it possible to reduce the resonant-like behavior of the transducer module, in particular of an RCLED.

In one preferred refinement of the invention, the holding and coupling part forms a cylindrical cutout, one of whose ends contains the transmitting and/or receiving element, and whose other end forms the

coupling area for an optical fiber. The holding and coupling part is accordingly essentially a cylinder, at one of whose

the optoelectronic module as claimed in claim 1, with the external contour of the holding and coupling part being coupled to the plug holder.

On the basis of the solution according to the invention, the plug has a protective bracket which can move relative to the housing of the plug, and which has at least one opening for an optical fiber in the plug. When it is not inserted, the protective bracket is arranged as protection in front of the optical fiber which projects out of the plug housing.

The plug housing which can be coupled to the plug has a number of steps, with one step on the plug housing acting as a stop for the protective bracket on the plug. During insertion of the plug into the plug housing, the protective bracket abuts against this stop and is then pulled back into the housing of the plug, with the optical fiber or fibers in the housing of the plug projecting through the corresponding openings in the protective bracket.

The arrangement of a protective bracket allows "blind" insertion, as is frequently required in automotive designs, and which in the process protects the fiber end surface against dirt.

The so-called "Kuchiri" criterion is known for this purpose: the fiber is protected in a type of "scabbard" (Japanese: Kuchiri) such that the fiber cannot project out of the protective environment until the plug has been introduced into the plug housing, so that it is positioned in front of the appropriate transducer without becoming dirty.

The plug preferably has two optical fibers, whose center axes are separated by 5 mm. The plug in this case preferably has a width of 13.5 mm, so that it

satisfies the industry "small form factor" standard.

Patent Claims

1. An optoelectronic module (1) having
- a transmitting and/or receiving element (6),
- a mount (5) on which the transmitting and/or receiving element (6) is arranged,
- a holding and coupling part (2), which holds the transmitting and/or receiving element (6) and is at least partially filled with an encapsulation material (21), and which has a coupling area (27) for connection of an optical waveguide, and
- an electrical drive and/or receiving circuit (32) for the transmitting and/or receiving element (6)

characterized

in that the electrical drive and/or receiving circuit (32) is arranged outside the holding and/or coupling part (2) on a submount (3), which lies on a plane which runs parallel to the longitudinal axis of the coupling area (27).

2. The module as claimed in claim 1, characterized in that the holding and coupling unit (2) forms a cylindrical cutout (25), one of whose ends contains the transmitting and/or receiving element (6), and whose other end forms the coupling area (27) for an optical waveguide.

3. The module as claimed in claim 1 or 2, characterized in that the mount (5) is fitted only with the transmitting and/or receiving element (6) or with the transmitting element and a monitor diode.

4. The module as claimed in at least one of the preceding claims, characterized in that the mount (5) is a

leadframe, which provides an electrical link for the transmitting and/or receiving element (6) and is electrically connected to the submount (3).

5. The module as claimed in claim 4, characterized in that the leadframe (5) runs at right angles to the longitudinal axis of the coupling area (27), at least in the area of the holding and coupling part (2).

6. The module as claimed in at least one of the preceding claims, characterized in that the encapsulation material (21) forms an integrated lens (22) on the side facing the coupling area.

7. The module as claimed in claim 6, characterized in that a fiber stop ring (23) is formed in the encapsulation material (21) around the lens (22) and prevents the end surface of an optical fiber which is inserted into the coupling area (27) from touching the lens apex.

8. The module as claimed in at least one of the preceding claims, characterized in that the module (1) is mechanically coupled to a plug housing (71, 71', 16).

9. The module as claimed in at least one of claims 1 to 7, characterized in that the module (1) is mechanically coupled to a naked fiber adaptor (9).

10. The module as claimed in claim 9, characterized in that an optical fiber (12) is firmly clamped by means of a clamp (11) in an area of the naked fiber adaptor (9) which is in the form of a trough.

11. The module as claimed in claim 9, characterized in that the naked fiber adaptor (9) is formed by an extension to the cylindrical coupling area (27).

12. The module as claimed in at least one of the preceding claims, characterized in that the submount (3) can be mounted on a main circuit board (8), in particular by SMD mounting.

13. The module as claimed in claim 12, characterized in that the main circuit board (8) is used as a heat sink for the submount (3) and/or for the electrical drive and/or receiving circuit (32) which is arranged on the submount (3), with the submount (3) having plated holes (33) which are also used for heat conduction.

14. The module as claimed in at least one of the preceding claims, characterized in that the holding and coupling part (2) and/or the submount (3) have/has self-coupling structures (61, 62) which allow automatic adjustment of the elements with respect to one another and/or with respect to a main circuit board (8).

15. The module as claimed in at least one of the preceding claims, characterized in that a housing cover (4) is provided and surrounds the submount (3) with the electrical drive and/or receiving circuit (32), and/or that end of the holding and coupling part (2) which faces away from the coupling area (27).

16. The module as claimed in at least one of the preceding claims, characterized in that the holding and coupling part (2) and/or the housing cover (4) are/is provided with an electrically conductive layer, and/or are/is composed of a conductive plastic material.

17. The module as claimed in at least one of the preceding claims, characterized in that the holding and coupling part (2) is in the form of a double chamber and,

in parallel, separate areas, has firstly a transmitting element and secondly a receiving element, each of which can be coupled via a separate coupling area (27) to an optical fiber (152).

18. The module as claimed in at least one of the preceding claims, characterized in that the submount (3) is arranged underneath the coupling area (27) of the holding and coupling part (2).

19. A plug arrangement having a plug housing (16) and a plug (15), in particular for an optoelectronic module (1) as claimed in claim 1, with the plug (15) having a housing (151) and at least one optical fiber (152), which is arranged in the housing (151) and projects out of it, characterized in that the plug (15) has a protective bracket (153), which is provided with openings (153a) for the at least one optical fiber (152), can move relative to the housing (151) and, when not inserted, is arranged in a locking position as protection in front of the optical fiber (152) which projects out of the housing (151), and the plug housing (16) has a number of steps, with one step on the plug housing (16) acting as a stop for the protective bracket (153), such that the protective bracket (153) is moved from the locking position to the stop during insertion of the plug into the plug housing (16), and is pulled back into the housing (151), with the at least one optical fiber (152) projecting out of the corresponding opening (153a) in the protective bracket (153).

20. The plug arrangement as claimed in claim 19, characterized in that the plug (15) contains two optical fibers (152), whose center axes are preferably separated by 5 mm.

21. The plug arrangement as claimed in claim 19 or 20, characterized in that the protective bracket (153) is connected to the housing (151) via attachment arms (153b) and is arranged such that it can be moved into the housing (151), and moves back to the locking position, when the plug (15) is not inserted, during removal of the plug (15) from the plug housing (16).

22. The plug arrangement as claimed in claim 21, characterized in that the plug (15) has latching elements (156) via which the plug (15) can be latched in the plug housing (16).

23. The plug arrangement as claimed in at least one of claims 18 to 22, characterized in that the plug housing (16) has three steps, with the second step acting as a stop for the protective bracket (153) on the plug (15).

24. A plug for a plug arrangement as claimed in claim 19, characterized in that the plug (15) ha a protective bracket (153) which can move relative to the housing (151).

25. A plug housing for a plug arrangement as claimed in claim 19, characterized in that the plug housing (16) forms a plug holder with a number of steps.